

Semantic satiation in schizophrenia. The role of valence of stimuli

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Summary

Aim. The primary aim of the research was to define the relation between semantic satiation effect, overactivation of semantic network and a symptom of derealisation in people suffering from schizophrenia. The semantic satiation was defined as the subjective and temporary experience of loss of meaning of repeatedly pronounced words or images which is the result of excessive activation in the semantic network. Because overactivation in semantic network is common feature of schizophrenia, it was expected that schizophrenic patients would be prone to satiation effect more than healthy subjects.

Methods. Satiation of negative, positive and emotionally neutral images was determined for patients suffering from schizophrenia and in healthy controls. The subjects were presented with pictures from different categories flashed on a computer screen 3, 13, 23 and 33 times.

Each presentation was followed by the category name and the subjects decided, whether the object presented on the photograph belonged to this category. It was expected that the loss of meaning of satiated images would delay participants' lexical decision and that this effect should be stronger for the schizophrenic than for the control group.

Results. Reaction times to a decision based on repeated images were longer in a group of patients suffering from schizophrenia than in the control group. It was also observed that in the group of patients the satiation effect depends on valence of satiated images. Emotionally positive and negative pictures were satiated faster than neutral ones.

Discussion. The conducted experiment confirmed the greater susceptibility of patients to the effect of semantic satiation. It has been revealed that subjective experience of the loss of meaning of images depends on the valence of stimuli.

semantic priming / semantic satiation / schizophrenia

INTRODUCTION

Dereism can be defined as a sense of unreal physical and social world, or changed and unreal perception of the reality. This symptom is considered to be a characteristic of schizophre-

nia and it results in disregard for reality demands which is typical for these patients [1]. One of the manifestations of the dereism phenomenon is the tendency to assess reality in an inadequate way. Another characteristic trait of schizophrenic patients is descriptive orientation, i.e. a tendency to ignore the content valence in the encoding process [2]. Schizophrenics tend to focus on descriptive features of a situation and thus overlook its emotional meaning, which probably results from their inability to recognise the affective properties of an event. This effect is particularly strong in conditions where negative information is processed. The patients process

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negative content in a distorted way, recalling it as ambiguous or positive, therefore neutralising the strength of negative emotions. The common trait of dereism and descriptive orientation is a tendency to evaluate social situations on the basis of their strictly descriptive external features and ignore their meaning and purpose. Due to the 'escape' into descriptiveness, despite the fact that the patients are able to estimate the accuracy of formal evaluation one can assume there is a connection between aforementioned phenomena and semantic satiation.

Semantic satiation is defined as the subjective feeling of the loss of access to repeatedly pronounced material which appears after quick succession of repeated word or multiple reading of written text [3, 4, 5]. We cease to understand the words' meaning, retaining at the same time the ability to recognise their formal features, like shape or size of font. The effect of satiation is transient: it appears during a word's repetition and fades away only a couple of seconds after the repetition stops. It can significantly affect the communication, since the person experiencing this effect is unable to understand the text that is read or spoken. Semantic satiation seems to be the result of excessive activation in the semantic network [5]. While single pronunciation of the word activates an adequate concept node, quick succession of repeated pronunciations may cause an overload and consequently make it difficult to access the meaning.

Current research on semantic satiation effect is based on semantic priming procedures, where the subjects are presented with two consecutive words: the former of which is satiated by repeated displays. In a classic procedure the first word is displayed 30 times and after the presentation of the second stimulus the subjects decide whether the two words are semantically connected, i.e. whether they are synonyms or names of the objects belonging to the same category. It is assumed that in the satiation condition, the subjects would temporarily lose access to the meaning of the first stimulus, which should result in longer decision time and greater number of mistakes.

Most of the studies on semantic satiation were based on lexical material, with the exception of Lewis and Ellis's research [6]. Lewis and Ellis provided the participants with the series of pho-

tographs showing one famous person. They assumed that satiation of the image should impede the access to information concerning the person. Next, the participants were presented with a photograph of another person and asked to decide whether both figures are related. When the first photograph was presented for the third time, the subjects easily established the relationship between models, while 30-times repeated presentation resulted in longer decision time and increased number of mistakes.

The research on semantic satiation carried out with verbal associations tests shows that multiple repetition of the same word leads to linguistic aberrations characteristic for schizophrenia. The subjects who are asked for verbal associations to a previously repeated word, tend to convey the answers that cannot be associated with the meaning of satiated stimulus, repeat the original word or one of the initial associations, mention the words that rhyme with satiated stimulus or else react with incomprehensible sequences of sounds [7, 8, 9].

Since Bleuler's time, disturbed language is considered to be the primary symptom of schizophrenia [10]. The most noticeable form of language disturbances is a loosening of associations in the semantic network. The research on semantic network activation shows that excessive semantic activation, i.e. faster activation of nodes, is relatively common among schizophrenic patients [11, 12, 13, 14, 15, 16, 17]. Since the satiation phenomenon appears when the semantic nodes become excessively activated, we can assume that in schizophrenic patients the node overload may be caused by less repetitions as compared to the subjects who are not prone to hyperactivation. This could point to schizophrenics' greater susceptibility to semantic satiation effect, which was the subject of Prochwicz's [18] research on satiation of positive, negative and neutral words with a high or low level of abstraction. In this study the satiation of positive and negative words in schizophrenic patients was accompanied by the loss of valence recognition, while neutral words remained unaffected by satiation. For the words of high and low abstraction level, the satiation process contributed to more abstractive perception of words representing real objects and correct recognition became slower accordingly to a growing number of repetitions, until it matched the speed

of abstractive words processing. Among healthy subjects, the satiation effect didn't occur. The results of Prochwicz's research [18] indicate that semantic satiation in schizophrenia was not related to non-semantic factors, as the subjects' fatigue. When the participants' level of fatigue was parallel to a fatigue observed in the research on satiation but the meaning of satiated images wasn't required for semantic decision, the participants' reactions weren't prolonged and the number of mistakes was not increased.

In the current study, it was assumed that increasing the number of image repetitions should delay the categorisation process of the objects presented on the images. It was predicted that the effect should be stronger in the schizophrenic patients' group than in healthy controls.

SUBJECTS

The experiment was carried out in a group of 23 patients of the Józef Babiński Psychiatric Hospital in Kraków, 10 men and 13 women, aged between 19 and 42 (average age $M = 31.08$, $SD = 7.01$). The patients' education was mainly secondary (16 subjects), academic (6 subjects) and vocational (1 subject). Selection criteria were based on a medical diagnosis of paranoid schizophrenia according to ICD-10 and lack of distinct symptoms of motoric deceleration estimated by hospital staff, as well as lack of symptoms of mental impairment and patients' confirmed consent. All schizophrenics were receiving antipsychotic medication at the time of testing.

The control group consisted of 23 healthy subjects matched the patients accordingly to their age ($M = 32.24$, $SD = 7.91$) and sex (10 men, 13 women). The controls' education was secondary (16 subjects) and academic (7 subjects).

Before the experiment, all participants were asked to complete a paper version of the categorisation test choosing from the sequence of images the one that didn't fit in. This test was performed to eliminate any possible influence of the categorisation process disturbances.

MATERIAL AND METHOD

The subjects performed a computerised categorisation test. The tests used 80 photographs

from different categories of International Affective Picture System technique (animals, plants, furniture, vehicles, buildings). Each photograph from IAPS is categorised with respect to its valence. For the experiment, negative, positive and emotionally neutral pictures were used. The subjects were presented with pictures flashed on a computer screen: each presentation was repeated at short intervals. All photographs were divided into 4 groups consisting of 20 pictures of different satiation levels. In the first group, the pictures were repeated 3 times, in the second – 13 times, third – 23 times and fourth – 33 times. A single presentation lasted 500 ms, while the intervals between displays lasted 200 ms. The 4 images groups were matched on levels of valence. Each presentation was followed by the word representing category and the subjects were asked to decide, whether the object presented on the photograph belonged to this particular category. It was expected, that the increase of image repetitions would result in limited access to its meaning and consequently more difficult categorisation. This difficulty should manifest itself in longer reaction times. The task consisted of both compatible and incompatible pairs. The participants responded with the help of a computer keyboard.

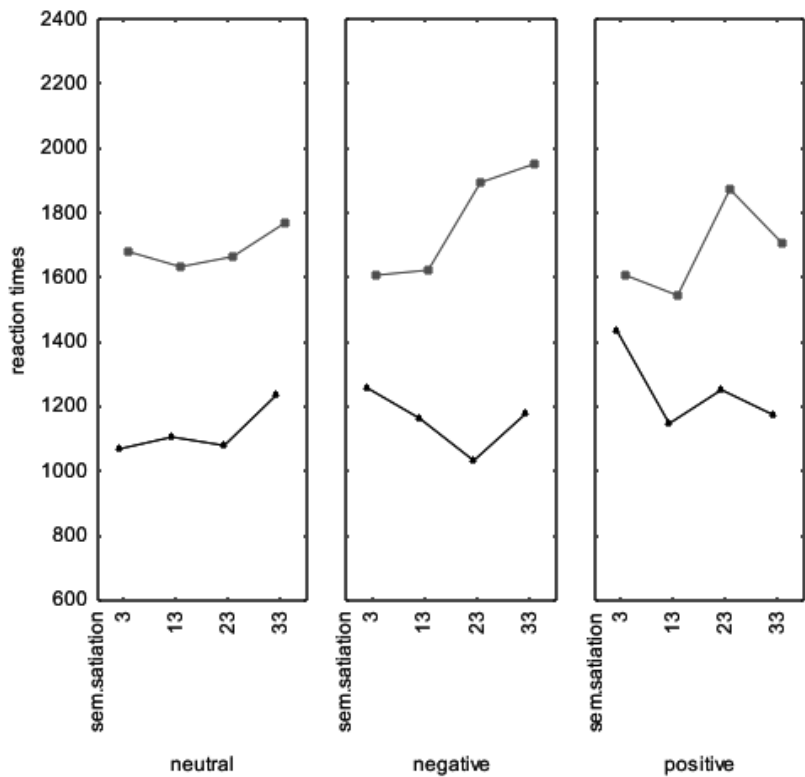
RESULTS

Schizophrenic patients tended to lose access to image meaning when the number of displays rose from 13 to 23 ($F[1.66] = 9.82$; $p < 0.002$). Differences between average reaction times for the 3 and 13 repetitions' condition and 23 and 33 repetitions were statistically irrelevant. Reaction times analysis for groups of stimuli of different valences proved that only images of positive and negative valence were susceptible to satiation, while reaction times for neutral images remained unchanged in spite of the number of repetitions. For both, positive and negative images average reaction times rose significantly when the number of presentations rose from 13 to 23 ($F[1.66] = 6.76$; $p < 0.01$; $F[1.66] = 6.22$; $p < 0.01$). The satiation effect did not occur in the control group. This phenomenon wasn't also observed in separate analysis of positive, negative and emotionally neutral stimuli, however for posi-

tive images, the subjects’ performance improved, when the number of expositions rose from 3 to 13 ($F[1.66]=3.95$; $p<0.05$). The mean reaction times for the four conditions are shown in Fig1.

ics, the satiation phenomenon is discrete and probably occurs after some ‘critical’ number of repetitions, while further presentations do not necessarily have to increase access time accord-

Figure 1. Mean reaction times for the four satiation levels of neutral, negative and positive images for patients suffering from schizophrenia and for control group.



DISCUSSION

The conducted experiment confirmed the greater susceptibility of patients to the effect of semantic satiation. Results indicated that loss of meaning of images depends on the valence of stimuli.

The schizophrenic patients’ loss of access to meaning manifesting itself in slower performance in satiated image categorisation tasks was observed when the number of expositions rose over 13. The effect did not occur when images were repeated less than 13 times. More than 23 repetitions did not intensify the satiation effect, which remained stable even when the stimuli were repeated 33 times. Therefore, we can assume that for schizophrenic patients 23 activations of semantic network node led to its overload and subsequent loss of access to its meaning. These results suggest that for schizophren-

ingly. The experiment confirms that the satiation effect occurs faster in schizophrenics than in healthy subjects. An increase of repetitions did not affect reaction times in the control group – on the contrary, for emotionally positive images moderate increase of repetitions might improve the performance in the categorisation task. Separate reaction times analysis for positive, negative and emotionally neutral image showed that the satiation effect occurred only for positive and negative images, while the meanings of neutral objects remained accessible even in intensive satiation conditions, which means that schizophrenic patients cease to understand the meaning of affective content after relatively short exposition.

The results enable us to explicate derealisation effect, which is characteristic for schizophrenia, as well as the patients’ tendency to focus on exterior, descriptive features of the event in semantic satiation context. The fact that schizophren-

ics lose their ability to recognise the meanings of objects presented on photographs after relatively short exposition suggests that they are prone to the satiation effect even in natural conditions, regardless of tiresome experimental procedures. This inability to recognise meaning of the situation may result in a tendency to perceive the outside world as unreal, in a false evaluation of reality or in a lack of consideration for the sense of events in everyday life. Since the satiation phenomenon doesn't affect the formal aspects of satiated words or images, the schizophrenic patients should be prone to event evaluation based only on their formal characteristics, such as colours or shapes, which can be explained by descriptive orientation typical for schizophrenics. The results highlight the significance of the patients' tendency to ignore the meaning of affective information. Since emotionally positive and negative images become satiated faster than emotionally neutral stimuli, the descriptive orientation and derealisation phenomena should apply particularly to intensely affective events. In such a case, the satiation phenomenon would serve as an intensive emotions' neutralisation mechanism.

The results provided are restricted by many limitations. Reaction times are no sufficient parameter in schizophrenia research as patients are generally slower than healthy people. The lack of an objective measure of psychomotor retardation is an important limitation of the study. The delay in the repetition conditions may reflect fatigue rather than semantic satiation. Although the results of former research indicate that semantic satiation in schizophrenia is not related to non-semantic factors, this conclusion was based on research used only in lexical material, which is not as complicated as colour images.

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